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STRUCTURE OF THE CANADIAN PLASTICS INDUSTRY

IGM88D-104-731-G
CNRC 28910

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May 1988

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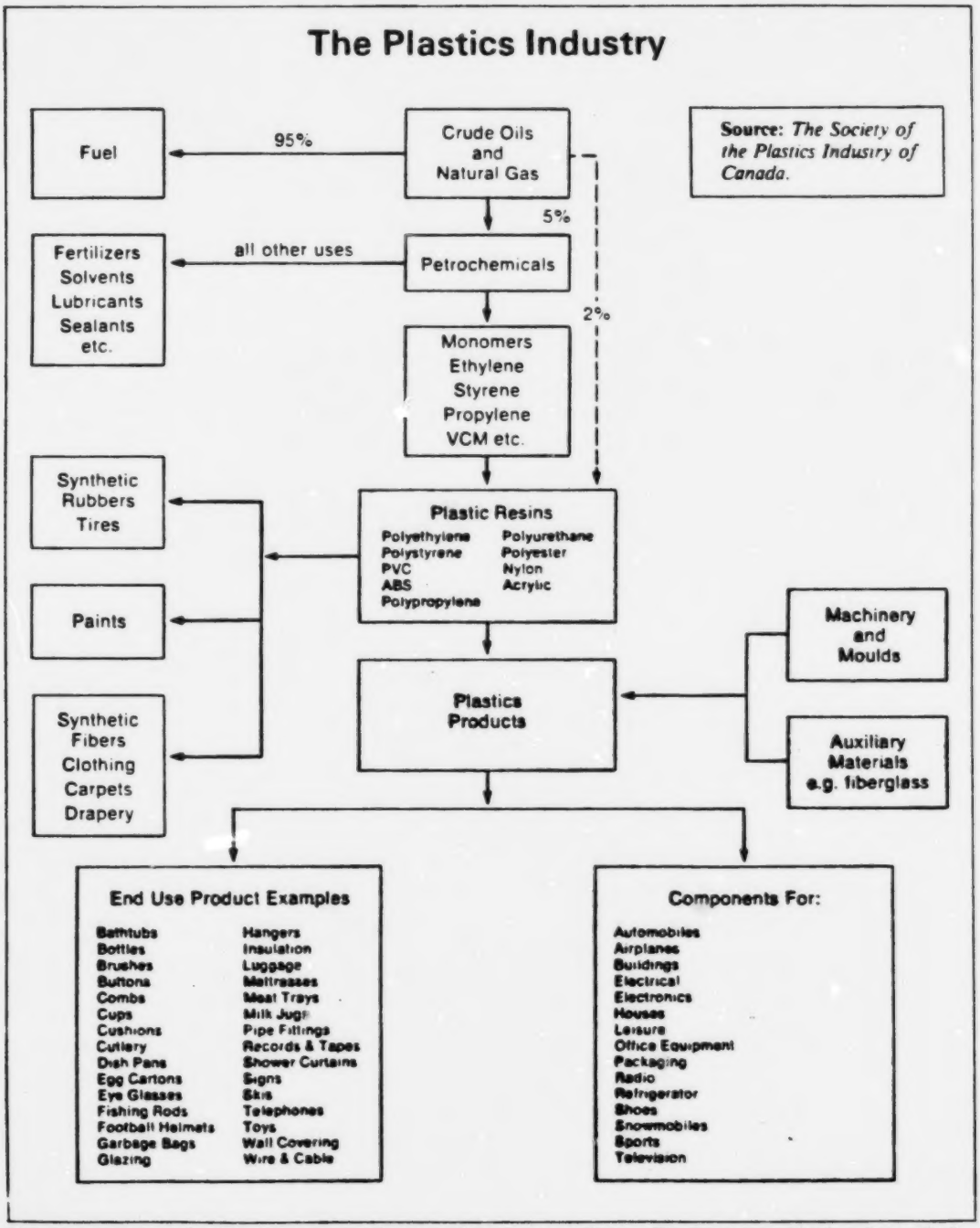
SUMMARY

STRUCTURE OF THE CANADIAN PLASTICS INDUSTRY

The plastics industry covers a broad range of chemical and mechanical operations starting with the preparation of polymers from monomer by petrochemical plants and culminating with the transformation industry to produce commercial plastics parts.

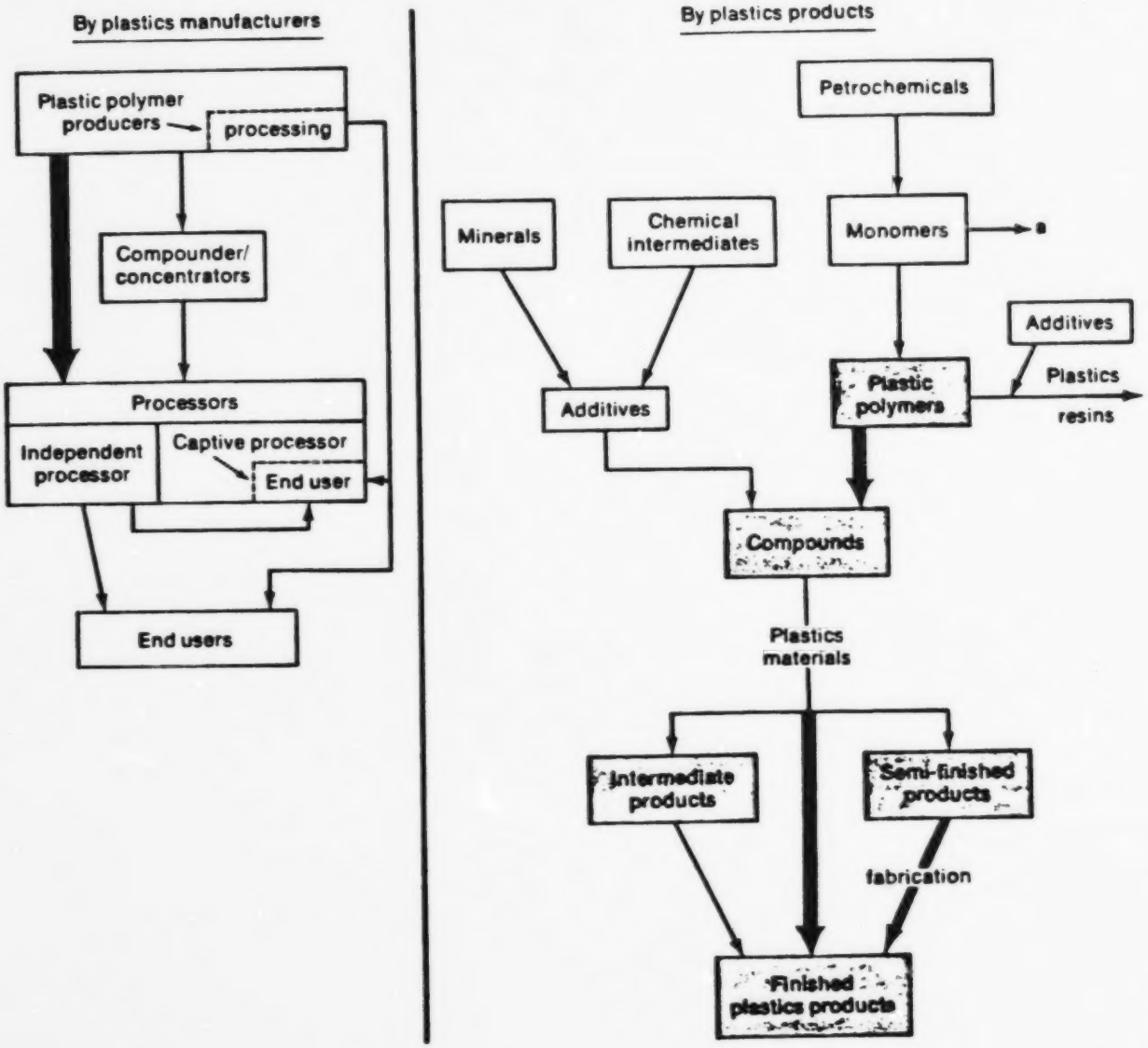
Many resin producers operate large captive plastics fabricating operations. Furthermore, the industry definition must always incorporate some of the aspects of the resin compounding or formulation industry, the plastics additive industry, the machinery industry, the tool and die industry, and some parts of the finishing industry. It should be also recognized that there are many plastics-related activities which are directly associated with or represent major parts of other types of industrial activity. For example, the communications, electrical and electronics, and the automotive industries operate large and numerous plastics processing facilities in conjuction with their products. Thus, any reference to the plastics industry emplies a system approach where all the interaction between the above components must be taken into consideration. Figures 1 and 2 illustrate this relationship.

FIGURE 1



The shaded areas of the chart represent the elements of the plastics industry. The 2 per cent of oil and gas which goes into plastics represents both the feedstock for the resin and the energy used in manufacturing.

Figure 2. STRUCTURE OF THE PLASTICS INDUSTRY



a—Acrylic sheet and small amounts of sheet from other polymers formed directly from monomers.

INTRODUCTION

During the preparation of this report, it was found that exact statistics and a complete picture of the Canadian plastics industry would be difficult mainly because the SPI and Statistics Canada both define the industry differently.

The SPI uses the following definition: "The Plastics industry is composed of those companies engaged:

a) in the production of resins, compounds and additives including distributors;
b) in the processing of these materials into products;
c) in making processing machinery and accessories;
d) and in fabricating moulds and dies."

Statistics Canada views the plastics products industries:

a) as a miscellaneous grouping "which cannot be classified elsewhere" (for example, plastics parts for household appliances);
b) as those assigned to the appropriate industry such as toys, automotive parts including film & sheet extrusion. Over 40 Standard Industrial Classifications (SIC) can be found. It is estimated that the definition of Statistics Canada only represents half of the industry as defined by the SPI.

Furthermore, numerous companies use more than one processing method and manufacture several different types of products; while others are

distributors of imported resins and compounds but also produce compounds and/or concentrates.

Since the main purpose of this report is to inform you about the structure of the Canadian plastics industry, the majority of the informations and statistics were taken from the SPI, the monthly magazines on plastics published in Canada and the Canadian Plastics Directory and Buyers' Guide. We recommend reading the Canadian Plastics Statistics Year Book 1987 (SPI) for those who wish to acquire a complete grasp of this most dynamic industry.

RAW MATERIALS

The raw materials industry is divided into mainly two major groups, which are the plastics and the additives suppliers.

The plastics suppliers include resins producers (1), compounders (2) and distributors (3) totalling an estimated 110 establishments. The additives (4) industry is represented by Canadian companies, distributors and compounders producing concentrates and master batches. It is estimated that there are 260 establishments.

(1) petro chemicals, multinational
(2) mostly Canadian compounding companies
(3) sales agencies, mostly imported resins and compounds
(4) pigments, fillers, antioxidants, etc.

RESINS PRODUCERS

Resins producers are straining their resources to meet the large demand for resins. Coupled with market growth, is the increasing need for higher resin quality and new product development. Processors are demanding more from their suppliers to help them compete globally. Canada's resin manufacturers are tackling the new challenges with emphasis on expansion, modernization and research & development. The following tables 1 and 2 indicate the capacity of major Canadian resin producers. However, the tightening of raw materials which began a year ago is still very much in existence, especially for polyolefins. Polyethylene demand, which already has industry supply-demand balance in a tight situation, will continue to increase during the next 3 to 4 years and so will prices. Polypropylene, although no longer on allocation, will remain in tight supply, probably until 1990-1992.

Canadian processors of linear low density polyethylene resins (LLDPE) have excellent opportunity to boost export sales since they have world-leading expertise and technolgoy in linear resins. They are particularly expert in strong, high gloss bags; tough pallet stretch wraps; thin container lids; wire & cables packaging and a host of medium density injection molded products.

TABLE 1

Location and Capacity of Major Canadian Resin Manufacturers (June 1987)

Resin	Producer	Location	Capacity (Thousand metric tonnes)	% LLDPE	Future capacity
Low-density polyethylene	C-I-L	Edmonton	73		
	Dow Chemical	Sarnia	76		
	Novacor	Sarnia	90		
	Petromont	Montreal East	100		
Linear low-density polyethylene/ High-density polyethylene	Dow Chemical	Ft. Sask., Alta.	120	100%	20 ('88)
	Du Pont	Sarnia	240	40%	
	Esso	Sarnia	175	77%	
	Novacor	Red Deer, Alta.	270	100%	70 ('88)
		Sarnia	120	15%	
High-density polyethylene	Dow Chemical	Sarnia	50		
Polypropylene	Himont	Varennes, Que.	105		
	Shell	Sarnia	91		19 ('88)
ABS	Borg-Warner	Cobourg, Ont.	40		
	Monsanto	La Salle, Que.	30		
Polystyrene	Dow Chemical	Sarnia	98		
	Huntsman Russtek	Mansonville, Que.	16		8 ('87)
	Plasti-Fab	Calgary			
	Polysar	Cambridge, Ont.	40		
		Montreal	36		
	Texstyrene	Montreal	6		
Polyvinyl chloride	Esso Chemical	Sarnia	100		
	B.F. Goodrich	Niagara Falls	115		15 ('88)
		Shawinigan, Que.	60		
		Ft. Sask., Alta.	100		7 ('88) 8 ('90)

CANADA'S RESIN PRODUCERS AT YEAREND 1986

TABLE 2

Producer	Plant location	Capacity (kilotonne/yr)
Polyethylene HDPE		
Dow Chemical Canada	Sarnia, Ont	50
LLDPE/HDPE		
Dow Chemical Canada	Fort Saskatchewan, Alta	120
Esso Chemical Canada	Sarnia, Ont	135
Novacor Chemicals	Joffre, Alta	340
	Moore, Ont	105
LLDPE/LDPE/HDPE		
Du Pont Canada	Corunna, Ont	232
LDPE		
C-I-L	Edmonton, Ont	73
Dow Chemical Canada	Sarnia, Ont	68
Petromont	Montreal, Que	70
Novacor Chemicals	Moore, Ont	90
Polypropylene		
Himont Canada	Varennes, Que	100
Shell Canada Chemical	Corunna, Ont	91
Polyvinyl chloride		
Esso Chemical Canada	Sarnia, Ont	100
Huntsman Husstek Polymers of Canada	Mansonville, Que	16
Polystyrene		
Dow Chemical Canada	Sarnia, Ont	97.5
Polysar	Cambridge, Ont	40
	Montreal, Que	36
Expandable polystyrene (EPS)		
BFGoodrich Canada	Niagara Falls, Ont	92
	Shawinigan, Que	48
	Fort Saskatchewan, Alta	100
Texstyrene	Baie d'Urfe, Que	5.5
Acrylonitrile-butadiene-styrene (ABS)		
Borg-Warner Chemicals	Cobourg, Ont	40
Monsanto Canada	Montreal, Que	25
Phenolic molding compounds		
Canadian Occidental	Fort Erie, Ont	7
Reichhold	Lindsay, Ont	4
Polymethacrylates		
Chemacryl Plastics	Niagara Falls, Ont	8
Rohm & Haas Canada	Morrisburg, Ont	8.2
Nylon		
BASF Canada	Amprior, Ont	5.5
Du Pont Canada	Kingston, Ont	85
Firestone Textiles	Woodstock, Ont	1
Thermoset polyesters		
Ashland Chemical	Mississauga, Ont	9
Dow Chemical Canada	Sarnia, Ont	7
Fiberglas Canada	Guelph, Ont	15
Fiberplast Products	Vancouver, BC	8
Iroquois Chemical	Cornwall, Ont	7.5
Reichhold	Ste-Therese, Que	6
	Toronto, Ont	6.5
	Port Moody, BC	3

Canadian demand for engineering resins is growing faster than that in the U.S. (see Tables 3 and 4).

Except for some grades of ABS, Nylon, Polycarbonate and PET. all the engineering resins are imported, mostly from the US, because our market has not justified the investment (see Table 5).

We could not obtain any statistics on the capacity or demand of thermosets resins; however, Table 6 indicates the consumption of reinforcements and resins which represent the composites industry in Canada. As you can see the marine sector experienced a growth rate of 16.5% As in the U.S. boat sales have been strong and continued to be so even after the October stock market crisis. The corrosion segment was up 26.3%, predominantly due to a number of capital projects in the pulp and paper industry. These had been planned for years but the companies lacked the funds to start them until last year. The appliance and electrical industry took the biggest drop in consumption continuing a trend started several years ago.

TABLE 3

North American demand for engineering resins

	1984	1990	1995	Avr. ann growth 1984-95 (%)
	(kilotonne)			
Nylons	180	283	351	6
Polycarbonate	143	231	315	7.5
Polyphenylene oxide	84	126	173	7
Acetals	54	78	105	6
Polybutylene terephthalate	51	73	89	5
Polyethylene terephthalate	5	18	31	18
Polysulfone	5	11	16	11
Polyphenylene sulfide	4	11	16	14
Alloys and blends	15	31	54	14.5
Total	541	862	1,150	7

Source: Adapted from a paper by Dow Chemical Canada Inc.

TABLE 4

Canadian market for engineering resins

	1984	1985e	Growth 1985-90 (%/yr)
	(kilotonne)		
PC	6.0	6.6	10
Nylon	6.0	6.5	8
PPO/PPE	3.7	4.1	10
Acetals	1.7	1.9	8
PBT	3.3	3.6	6
PET	0.2	0.2	20

TABLE 5

Generic Family	Manufacturer	Trade name	Canadian distributor
ABS			
	Bayer / Mobay	Novadur	Bayer (Canada)
	Borg-Warner ◆	Cycolac	Borg-Warner Chemicals
	Dow Chemical	Magnum	Down Chemical Canada
	Monsanto ◆	Lustran	Monsanto Canada
ABS/Nylon Alloy			
	Borg-Warner	Elemid	Borg-Warner Chemicals
	Monsanto	Triax	Monsanto Canada
Acetals			
Copolymer	BASF AG	Ultraform	BASF Canada
	Celanese Engineering Resins	Celcon	Celanese Canada
Homopolymer	E.I. du Pont	Delrin	Du Pont Canada
Liquid Crystal Polymers			
Aromatic Polyester	Celanese Engineering Resins	Vectra	Celanese Canada
	Dartco	Xydar	Dartco
Nylons			
Type 6	Akzo Plastics	Akulon	Canada Colors & Chemicals
	Allied-Signal	Capron	Allied-Signal Engineered Plastics
	BASF AG & BASF Canada ◆	Ultramid	BASF Canada
	Bayer AG	Durethan	Bayer (Canada)
	Firestone Canada ◆	Firestone	Firestone Canada
Type 66	BASF AG	Ultramid	BASF Canada
	Celanese Engineering Resins	Celanese	Celanese Canada
	E.I. du Pont & Du Pont Canada ◆	Zytel	Du Pont Canada
	ICI	Maranyl	C-I-L (unfilled nylon); LNP (filled nylon)
	Monsanto	Vydyne	Monsanto Canada
Type 11	ATO Chemie	Rilsan	Atochem Canada
Type 12	ATO Chemie	Rilsan	Atochem Canada
	Emser Industries	Grilon	Nuclear Fittings
	Huels	Vestamid	Nuodex Canada
Polyamide-imide			
	Amoco Performance Products	Torlon	Amoco Performance Products
Polyarylate			
	Amoco Performance Products	Ardel	Amoco Performance Products
	Celanese Engineering Resins	Durel	Celanese Canada
	E.I. du Pont	Arylon	Du Pont Canada
Polycarbonate			
	Bayer / Mobay	Merlon	Bayer (Canada)
	Dow Chemical	Calibre	Dow Chemical Canada
	General Electric	Lexan	GE Plastics Canada
Polycarbonate Blends			
PC/ABS	Bayer / Mobay	Bayblend	Bayer (Canada)
	Borg-Warner	Proloy	Borg-Warner Chemicals
	Dow Chemical	Pulse	Dow Chemical Canada
PC/Polyester	Bayer / Mobay	Makroblend	Bayer (Canada)
	Eastman Chemicals	Ektar	Eastman Performance Plastics
	General Electric	Xenoy	GE Plastics Canada
Polyether ketone			
	ICI	Victrex PEK	LNP
Polyether sulfone			
	ICI	Victrex PES	LNP
Polyetheretherketone			
	ICI	Victrex PEEK	LNP
Polyetherimide			
	General Electric	Ultem	GE Plastics Canada
Polyketone			
	Amoco Performance Products	Kadel	Amoco Performance Products
Polymethylpentene			
	Mitsui Petro-chemicals	TPX	Mitsui & Co (Canada)
Polyphenylene-based alloys and blends			
Polyphenylene ether copolymer	Borg-Warner	Prevex	Borg-Warner Chemicals
	Huels AG	Vestoran	Nuodex Canada
Polyphenylene oxide alloy	General Electric	Noryl	GE Plastics Canada
Polyphenylene sulfide			
	Celanese Engineering Resins	Fortron	Celanese Canada
	Philips 66	Ryton	Philips 66

Generic Family	Manufacturer	Trade name	Canadian distributor
Polyphenylene sulfone			
	Amoco Performance Products	Radel	Amoco Performance Products
Polysulfone			
	Amoco Performance Products	Udel	Amoco Performance Products
Polyarylsulfone			
	Amoco Performance Products	Mindel	Amoco Performance Products
Thermoplastic Polyesters			
Polybutylene terephthalate	Akzo Plastics	Arnite T	Canada Colors & Chemicals
	Allied-Signal	Petra	Allied-Signal Engineered Plastics
	BASF AG	Ultradur	BASF Canada
	Celanese Engineering Resins	Celanex	Celanese Canada
	Ciba-Geigy	Crastine	Ciba-Geigy Canada
	General Electric	Valox	GE Plastics Canada
	Huels AG	Vestadur	Nuodex Canada
Polyethylene terephthalate	Akzo Plastics	Arnite P	Canada Colors & Chemicals
	BASF AG	Ultradur	BASF Canada
	Bayer/ Mobay	Petlon	Bayer (Canada)
	E I du Pont & Du Pont Canada ♣	Rynite	Du Pont Canada
	Eastman Chemicals	Ektar	Eastman Performance Plastics

♣ Some grades are compounded in Canada.

TABLE 6

CANADA'S FRP MARKET, 1987

(Consumption of reinforcements & resin, metric tonnes)

Market Segment	% of Total	Material Consumption	Change over '86
Marine	26.3	19,222.4	+16.5%
Transportation	29.3	21,483.6	-13.5%
Consumer	8.1	5,949.5	-10.5%
Corrosion	11.8	8,677.1	+26.3%
Construction	16.0	11,752.7	-3.4%
Equipment & Appliance	0.1	87.8	-59.0%
Electrical	5.2	3,812.8	+29.0%
Miscellaneous	3.2	2,387.1	+33.9%
Total		**73,373.0**	**+2.0%**

Western Canada accounts for 22.2% of the total; Ontario - 50.9%; Québec - 21%; the Maritimes - 6.9%

Source: Fiberglass Canada Inc.

A list of additives and fillers/reinforcements can be found on Tables 7 & 8.

TABLE 7

List of Additives

Antiblocking agents
Antifoamer defoamer
Antifogging agents
Antioxidants
Antistatic agents
Antitalk compounds
Bacteriacids
Biocides
Blowing agents
Buffing compounds
Catalysts
Cell control/nucleating agent
Cling additive
Concentrates:
- color
- flame retardants
- foaming agent
- fragrance
- multifunctional
- silicone
- specialty

Coupling agents
Crosslinking agents
Deaerating agents
Deodorants
Dyes
Emulsifiers
Epoxy:
- curing agents
- diluents

Flame retardants
Flatting agents
Fluorescent agents
Fungicides
Gloss control agents

Heat stabilizers
Heat stabilizers/lubricant packages
Impact modifiers
Lubricants
Metal deactivators
Metallic powders
Mold release agents
Odorants
Optical brighteners
Photoinitiators
Pigments
Plasticizers
Plastisols
Polyesters initiator
Processing aids
Organic peroxides
Reodorants
Slip agents
Smoke suppressants
Surfactants
Tackifier
Thickening agents
Thixotropes
Toners
Urethane curing agents
UV absorbers, stabilizers
Viscosity depressants
Waxes
Wetting agents

TABLE 8

Fillers & Reinforcements

Alpha cellulose
Alumina trihydrate
Aramid fiber
Barrium sulfate
Boron fiber
Calcium carbonate
Calcium sulfate fiber
Calcium sulfate filler
Carbon black
Carbon graphite fiber
Ceramic fillers
Conductive fillers
Feldspar
Glass fibers
Kaolin
Magnesium oxide
Magnetic fillers
Metallic fibers
Mica
Microspheres
Mixed fillers/reinforcements
Nephelene syenite
Organic fillers
Perlite
Polyester fibers
Silica
Talc
Wollastonite

PRODUCTS

The following Table 9 shows a list of products made and the facilities (an operational unit, not a company) manufacturing these items.

There are at least 215 types of products and over 450 products made in Canada. The type of products processed by the most numerous operational units are:

Products	# facilities	Major processes
Sheet	787	extrusion
Films	642	"
Bags	525	" & converting
Containers	502	blow moulding & injection moulding
Pipes	370	extrusion
Trays	242	injection moulding
Boxes	220	" "
Furniture	204	" " extrusion & foam
Panels	189	Laminating, compression moulding
Automotive parts	159	see Appendix I

Products for the automotive industry are much more important than what these statistics indicate for obvious reasons (Appendix I).

Table 10 compares types of products associated to typical selection of plastics candidate.

TABLE 9

PRODUCTS				FACILITIES (1)
Advertising specialities				155
Ashtrays				15
Automotive parts (2)				159
Baby	baths	11	TOTAL	66
	bibs	5		
	diaper bags & pails	11		
	furniture	13		
	other	26		
Bags	blanket	30	TOTAL	525
	closure	26		
	garbage	60		
	garment	44		
	handle	69		
	industrial	63		
	notion & millenary	62		
	other	84		
	overnight	7		
	perforated	52		
	tote	28		
Balls	beach/toy	6	TOTAL	50
	foam	9		
	others	22		
	valve	13		
Banks (coin)				23
Bar accessories				29
Basins				15

(1) an operation unit.
(2) various products, see appendix.

PRODUCTS				FACILITIES (1)
Baskets	berry	23	TOTAL	75
	bread	16		
	waste	36		
Bathtub (shower enclosures)				43
Battery cases				20
Beakers				5
Bearings				28
Bellows				9
Belting				10
Billfolds				13
Bindings				20
Boats & canoes				104
Bowls				19
Boxes	cigar	16	TOTAL	220
	cutlery	20		
	jewelry	34		
	serving	15		
	tissue	19		
	other	116		
Brackets				19
Brush blocks				5
Brushes				16
Buckles				13
Bumpers				34
Buoyancy fill				21
Buoy				28
Bushings				58
Business machine housing & components				48
Buttons				19
Cabinets	kitchen	16	TOTAL	51
	medicine	19		
	vanity	16		

PRODUCTS				FACILITIES ([1])
Cables	clamps	23		
	other	18	TOTAL	58
	supports	17		
Canisters				15
Caps & closures				73
Carboys				19
Carpet underlays				11
Cartop carriers				11
Cassettes (hubs & cases)				20
Casters				22
Castings & Embedments				12
Ceiling	accoustics	5		
	components	11		
	fans	3	TOTAL	27
	other	8		
Chain				8
Chairs				30
Channeling (widow)				16
Chips	Bingo	19		
	Poker	20	TOTAL	39
Clothes	hangers	16		
	lines	5	TOTAL	24
	pins	3		
Coasters				44
Collanders				5
Combs				9
Connectors (electrical)				37

PRODUCTS				FACILITIES (1)
Containers	aerosol	11		
	cosmetics	67		
	food packaging	125		
	food storage	106	TOTAL	502
	industrial shipping	110		
	single service industry	83		
Covers				65
Crates	dairy & beverage	17		
	other	20	TOTAL	37
Cribbage boards				6
Cups	disposable	22		
	measuring	13	TOTAL	55
	mugs	20		
Curtains & draperies				9
Cushion materials				20
Cutlery				13
Decanter				8
Decorations	Christmas	24		
	other	41	TOTAL	65
Decorative laminates				25
Desk sets				32
Dials				13
Diffusers (lighting)				20
Dish	butter	7		
	disposable	14		
	melamine	2		
	soap	18	TOTAL	58
	pans	11		
	racks	6		

PRODUCTS				FACILITIES (1)
Dispensers	pill	12	TOTAL	60
	spray	9		
	tape	13		
	other	26		
Display items				117
Doors	folding	7	TOTAL	72
	sliding	20		
	stops	9		
	others	36		
Drapery hardware				16
Drums & barrels				28
Ductwork				45
Egg cartons				6
Eye shields				15
Fabrics	vinyl coated	25	TOTAL	52
	other	27		
Fascia				23
Fasteners				25
Fencing & fence posts				16
Films	acrylic	19	TOTAL	642
	cellulosic	26		
	coextrusions	40		
	laminates	57		
	metallized	32		
	nylon	20		
	polycarbonate	18		
	polyester	38		
	HDPE	76		
	LDPE	107		
	PP	53		
	PS	24		
	polyvinyl			

PRODUCTS				FACILITIES (1)
	alcohol	9		
	PVC	48		
	PVDC	12		
	TFE	16		
	vinyl copolymer	12		
	other	35		
Filters				16
	bait boxes	25		
	floats	19		
Fishing	lures	10	TOTAL	76
	equipment/other	22		
Floats				46
Floor runners				16
Flower Pots				45
Flume liners				17
Flyswatters				10
Footwear				14
	mirror	29		
	photo	43		
Frames	picture	46	TOTAL	159
	other	41		
	components	71		
	decorations	30		
	finished	28		
Furnitures	forms	12	TOTAL	204
	glides	21		
	patio	42		
Games				35
Garbage cans				27
Gaskets				36
Gears				31

PRODUCTS				FACILITIES ([1])
Glazing panels				15
Gloves				8
Golf	equipment	14	TOTAL	30
	tees	16		
Grips				6
Handbags				6
Handles & knobs	appliance	28		
	furniture & furnishings	20	TOTAL	96
	luggage	13		
	other	35		
Handrails				16
Hassocks				2
Helmets				12
Hobby & craft sets				8
Holders	letter	13		
	napkin	21	TOTAL	34
Hose	garden	12		
	industrial	24	TOTAL	36
Hospital equipment				41
Housewares				52
Ice	buckets	24		
	cube trays	14	TOTAL	38
Identification				
	cards	28		
	tags	58	TOTAL	86
Insulation	PS foam	25		
	rigid PU	32	TOTAL	96
	other	39		

PRODUCTS				FACILITIES (1)
Jars				32
Jerry cans				12
Jewelry	components	13		
	other	16	TOTAL	29
Joints	construction	12		
	expansion	20	TOTAL	32
Jugs				20
Juicers (fruit)				5
Key rings, Tags				59
Kitchen organizers				17
Labels	pressure sensitive	36		
	sleeves	19	TOTAL	86
	other	31		
Laboratory equipment				26
Ladder & parts				10
Lamps & lighting	components	38		
	shades	18	TOTAL	56
Lawn edging & garden supplies				15
Lenses				19
Letter	openers	15		
	numbers	50	TOTAL	65
Lids	cup	18		
	other	30	TOTAL	48
Luggage				
Luggage	components	20		
	tags	36	TOTAL	56

PRODUCTS				FACILITIES (1)
Manholes, tank				19
Marine	battery cases	20		
	buoyancy fill	13		
	components	32		
	fittings	14	TOTAL	201
	floats	36		
	hulls	35		
	other	51		
Markers (highway lane)				17
Mats				21
Mattress	covers	19		
	inflatable	5	TOTAL	41
	other	17		
Measuring devices				7
Models (architectural)				17
Nameplates				76
Novelties				67
Pails	household	16		
	industrial	27	TOTAL	43
Panels	construction	37		
	reinforced	54	TOTAL	189
	sandwich	47		
	other	51		
Pens & pencils				9
Pipes	ABS	30		
	corrugated	20		
	PE	58		
	PP	36		
	PVC	49		
	reinforced	46	TOTAL	370
	other	38		

PRODUCTS				FACILITIES (1)
	covering	25		
	fitting	58		
	sealants	10		
Pitchers				10
Planters				44
Plugs				29
Plumbing fixtures				25
Portion packaging				13
Radomes				12
Rainwear				11
Reflectors				7
Ring binders				21
Rods, tubes & shapes	thermoplastic	47		
	thermoset	49	TOTAL	96
Roof materials				22
Room dividers				13
Rope & twine				8
Rulers				21
Scrapers	window	13		
	windshield	27	TOTAL	40
Screens				9
Screws				7
Scrubbers				18
Sheet	ABS	37		
	acetal	22		
	acetate	36		
	acetate butyrate	24		
	acrylic	51		
	cellulosic	23		
	epoxy	23		
	fluorocarbon	21		
	melamine	21		
	nylon	35	TOTAL	787
	phenalic	28		
	PC	42		

PRODUCTS				FACILITIES (1)
	polyester	48		
	HDPE	70		
	LDPE	77		
	PP	52		
	PS	54		
	PVC	55		
	other	66		
Shelving				34
	heels	9		
Shoes	horns	10	TOTAL	32
	sles	13		
Shower caps				10
Siding (vinyl)				14
	indoor	115		
Signs	outdoor	114	TOTAL	229
Sinks				19
	binding	3		
Ski	handgrips	4	TOTAL	12
	poles	5		
Skis				4
Skylights				35
Snowmobile components				27
Spatulas				14
Sponges				9
Spools				21
Sport accessories				38
Stair treads				14
Stationery products				39
Stirrers				16
Strainers				8
Straws				10
Surgical equipment				19
Swimming pool liners				14
Table cloths				11

PRODUCTS				FACILITIES ([1])
Tanks	linings	80		
	transport	32	TOTAL	216
	other	104		
Tapes				36
Tarpaulins				21
Tents				11
Terminal boards				12
Thermometer cases				4
Tiles	floor	10		
	other	11	TOTAL	21
Toboggans				12
Toilet	seats	13		
	tank floats	9	TOTAL	22
Toothbrushes				7
Toys				37
Trailers				8
Trays	drip	21		
	foam	19		
	other	69	TOTAL	242
	packaging	52		
	seedling	28		
	serving	53		
Trim				29
Truck bodies				27
Tubes, packaging				29
Tubing				72
Valves & components				40
Vials, packaging				32
Wall coverings				18
Warning devices				9
Washers, faucets, etc.				13
Weatherstripping				29
Webbing				10

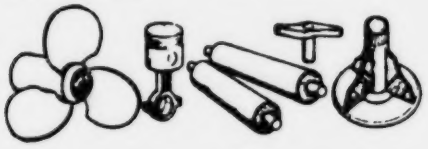
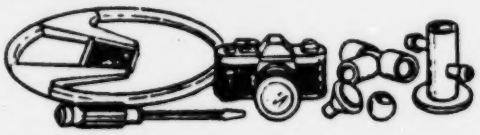
PRODUCTS			FACILITIES (1)
Wheels	caster 21 other 18 toy 18	TOTAL	57
Window	hardware/parts 24 profiles 41 shades 11 industrial 20 residential 26	TOTAL	122
Wire & cable			28
Yarns			9
TOTAL			

Type of product: 215

Total products:> 450

(1) an operation unit, part of a company.

TABLE 10

General part requirement and/or shape	Typical candidate pla
Structural, mechanical  Gears, cams, pistons, rollers, valves, pump impellers, fan blades, rotors, wash-machine agitators, seals	Acetal Allyl Nylon Phenolic Polycarbonate Poly(amide imide) Polyester (TP) Polyetheretherketone Polyimide Polyphenylene sulfide Sulfones
Light-duty mechanical and decorative  Knobs, handles, battery cases, cable clamps, trim moldings, camera cases, pipe fittings, eyeglass frames, auto steering wheels, handles for hand tools	ABS Acrylic Cellulosics Phenolic Polyethylene Polypropylene Polystyrene PVC
Small housings and hollow shapes Telephone and flashlight cases, sports helmets, luggage shells, headlamp bezels, housings for office machines, power tools, pumps, small appliances	ABS Alkyd Cellulosics Nylon Phenolic Polyphenylene ether Polycarbonate Polyester (TP and TS) Polyethylene Polypropylene Polystyrene
Large housings and hollow shapes Boat hulls, shrouds for motorcycles and agricultural equipment; housings for large appliances and communication equipment, camper tops, materials handling containers, pressure vessels, tanks, tubaducts, refrigerator liners	ABS* HD polyethylene* Polyphenylene ether* Polycarbonate* Polyester* (TP) Polyester/glass (TS) Polypropylene* Polystyrene* Polyurethane* PVC* *Often in structural foam
Optical or transparent parts Safety goggles, optical lenses and fibers, taillight lenses, safety and vandal-resistant glazing, refrigerator shelves, laboratory ware, instrument and gage faces, signs, food processing equipment, snowmobile windshields	Acrylic Allyl diglycol carbonate (CR-39) Polycarbonate Polystyrene Polysulfone Polyether sulfone Polyester (PET)
Parts for wear applications Gears, bushings, bearings, wear strips, tracks, valve parts, conveyor links, chute liners, roll covers, industrial tires, roller skate wheels	Acetal Nylon Phenolic Poly(amide imide) Polyester (TP) Polyimide Polyurethane UHMW polyethylene (These resins are often blended with a fluorocarbon to improve wear properties.)

PROCESSING INDUSTRY

It has been estimated that, although the number of processing plants are increasing every year (1), the average number of employees per plant have practically been the same for the last 10-15 years (30-36). Furthermore, the number of plants having less than 50 employees remained around 80% ± 5%.

The processing industry today, as shown on Tables 11 & 12 is made of 25 major activities (processes, manufacturing methods, etc.) totalling an estimated 2400 facilities. Some of these activities, such as decorating involve several operational steps and/or choices in the manufacturing process of a product, as shown on Table 13. One activity which was not mentioned anywhere is the assembling of parts. This is shown on Table 14.

Among the 2400 facilities, at least 175 include more than one method of processing plastics.

As expected, the greatest number of facilities are using injection moulding (428) and extrusion (345) processes.

(1) 1100 in 1975, up to 2300 in 1987 (±5%)

TABLE 11

PROCESS		NUMBER OF FACILITIES		
Blow moulding	extrusion	68		
	injection	31	TOTAL	116
	stretchblow	17		
Calendering				15
Casting	film	10		
	sheet	26	TOTAL	78
	other	42		
Compression/Transfer Moulding				47
Converting	film (bag-making)	85		
	film (coating, laminating)	73	TOTAL	190
	sheet	32		
Decorating & printing				168
Extrusion	film	90		
	pipe	72		
	profile	120	TOTAL	345
	sheet	50		
	foam/sheet	13		
Fabricating (foam)				43
Fabricating (rigid sheet)				111
Foam	Polystyrene block	16		
	Polystyrene cup	5		
	Polystyrene shapes	19	TOTAL	129
	liquid systems (PU, phenolic, etc.)	45		
	others	44		

PROCESS			NUMBER OF FACILITIES	
Injection moulding	thermoplastics	382		
	thermosets	46	TOTAL	428
Laminating	high pressure	47		
	low pressure	65	TOTAL	112
Metallizing & Plating	films	13		
	moulded products	15	TOTAL	28
Plastisol moulding				17
Reaction Injection Moulding (RIM)				16
Reinforced plastics (thermosets)	closed mould: (matched metal)	50		
	filament winding	54		
	open mould: (spray up, handlay-up)	170	TOTAL	305
	pultrusion	27		
	resin transfer moulding	3-5		
Rotational moulding				25
Solid phase pressure forming (SPPF)				31
Structural Foam Moulding				39
Thermoforming				154
TOTAL				**2397**

Table 12

Examples of companies using more than one process

A - Thermoplastics

Extrusion & injection moulding	46
Extrusion & blow moulding	12
Injection moulding & thermoforming	10
Extrusion & thermoforming	5
Others (more than 2 processes)	28

B - Thermosets (Reinforced plastics)

Open mould & filament winding	34
Closed mould and open mould	18
Closed mould and filament winding	11
Closed mould and pultrusion	11

Table 13 Process Selection Guide.

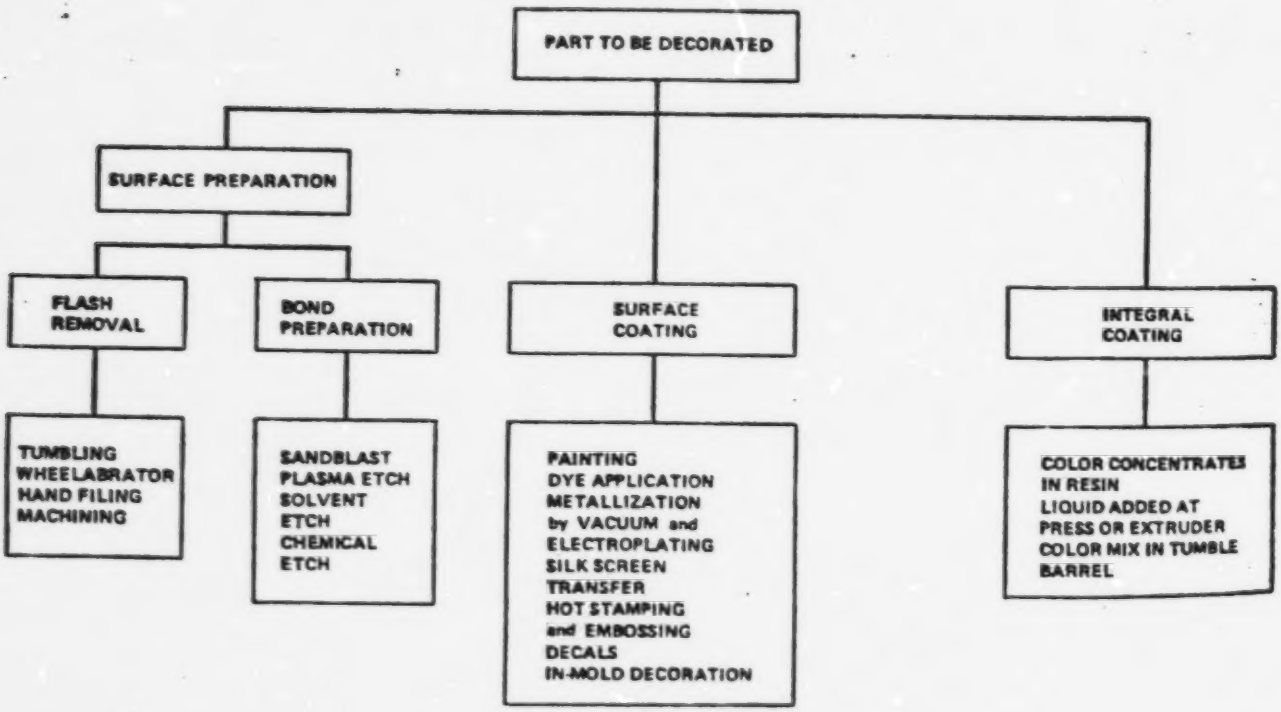
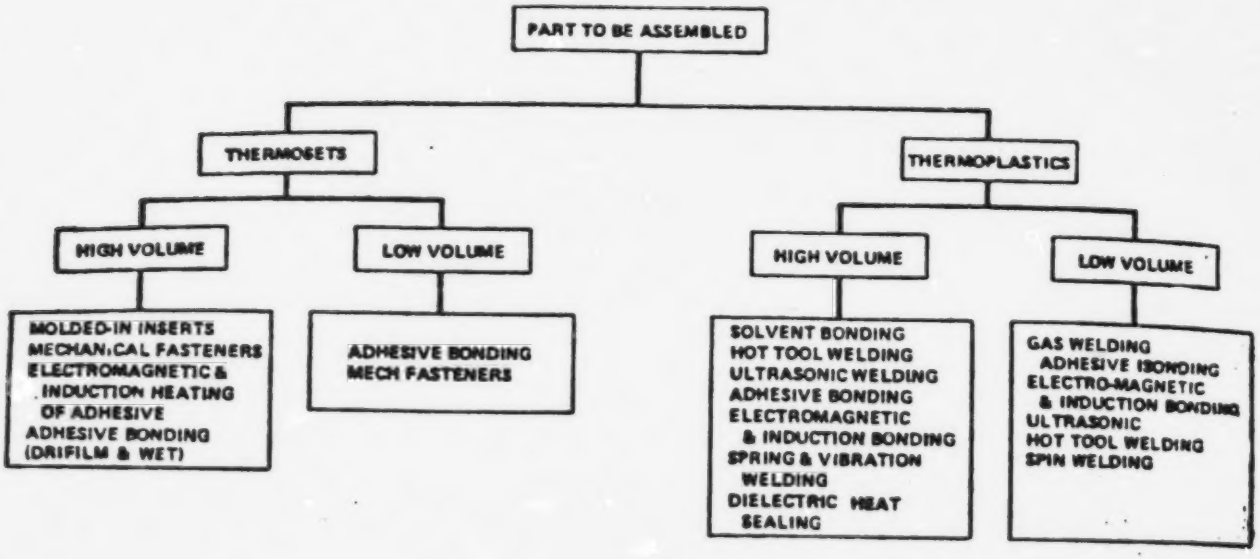


Table 14 Process Selection Guide.



CANADIAN PLASTICS MACHINERY & PARTS

The plastics machinery industry in Canada has grown by leaps and bounds in the last decade. The number of manufacturers has tripled since 1976. According to the Canadian Plastics list (Oct. 1986 issue) of Canadian made machinery, 75 companies were identified.

Canada's exports of plastics machinery have increased sevenfold in ten years, and totalled $84 million in 1985.

New manufacturers, new products, new markets and new customers combined to make 1987 a record breaking year for plastics machinery exports (see Table 15).

Although the United States continues to be the biggest market, Europe, India and the Far East have shown the most growth in recent years.

Word-of-mouth endorsements from satisfied customers have been the most common and effective selling tools for our machinery makers. Because most Canadian firms began as sales agents and service shops for forein machinery makers, they have built their reputations on customizing equipment to suit the customer. This ability has endeared them to foreign and domestic buyers alike. Satisfied customers are repeat customers and they generate extra orders through referrals.

The plastics processing machinery manufacturers are particularly renowned for their expertise in high-speed thin-wall molding, melt conveying, blown film coextrusion, and pipe corrugating.

Major Canadian manufacturers of plastic processing equipment are shown on Tables 16 & 17.

TABLE 15

CANADA'S EXPORTS OF PLASTICS MACHINERY & PARTS

(Cdn $'000)

Destination	1987	1986	1985	1984
Europe	21,207	13,268	12,864	9,466
Middle East	306	55	332	1,085
Far East	7,267	4,399	2,338	5,659
Latin America & Caribbean	3,066	3,986	2,048	1,640
U.S.A.	103,089	87,416	63,824	69,458
Other	1,278	2,139	2,757	3,080
Total:	**136,213**	**111,264**	**84,163**	**90,388**

Source: Statistics Canada Catalog 65-004.

TABLE 16

Major Canadian manufacturers of extruders and related equipment

Brampton Engineering (1983) Inc.
8031 Dixie Road South, Brampton, Ontario L6T 3V1. Tel: (416) 793-3000. Tlx: 06-97655.
Custom-built blown film extruders, including models for LLDPE and HMW-HDPE. Film line accessories: single-layer and coextrusion dies; internal cooling systems; screen changers (slide and continuous type); film winders (surface, single and dual turret types). Also builds extruders with screw diam up to 150 mm for pipe, profile, wire and cable, compounding and sheet.

Canadian Plastics & Rubber Machinery Ltd.
2455 Cawthra Rd, Unit 26, Mississauga, Ontario L5H 3P1. Tel: (416) 270-9666. Tlx: 06-960244.
Specializes in custom extruders and small portable and adjustable coextruders, screw diam 19 to 76 mm, that can be fitted with SCR drive motors and various types of instrument configurations.

Corma Inc.
10 McLeary Court, Concord, Ontario L4K 2Z3. Tel: (416) 669-9397. Tlx: 06-964583.
Corrugated plastic pipe, tubing and conduit machinery. Spiral-wound system for single and dual wall pipe using polyethylene, polyvinyl chlonde etc. as well as large diameter corrugated pipe-making systems. Range of options in extruder machinery. Downstream pipe extrusion equipment such as haul-offs and cutters.

Deltaplast Machinery Ltd.
130 Staffen Dr, Concord, Ontario L4K 2X3. Tel: (416) 669-2966.
Specializes in vertical and horizontal portable coextruders, with screw diam of 25 to 50 mm, for use in pipe, profile and sheet. Also builds a line of extruders from 25 to 200 mm for pipe, profile, sheet and film. Pipe and sheet dies, air strippers, vacuum-sizing and spray-cooling equipment are available from the same plant.

Future Design Inc.
271 Glidden Rd, Unit 1, Brampton, Ontario L6W 1H9. Tel: (416) 453-9978.
Accessories and technology for blown film extrusion: additive feeders; variable speed blowers; dual-lip air rings, cages, collapsing frames, dies, screws, turnkey extrusion systems for film systems, 25-150hp extruders.

Metaplast Ltd.
10345 Cote de Liesse, Dorval, Quebec H9P 1A6. Tel: (514) 631-5569.
Downstream equipment for profile, tubing, pipe, wire & cable and similar applications. Extrusion haul-offs, cut-off saws, vacuum-sizing tanks.

Lembo-Midland Ltd., Plastics Division
295 King St, Box 610, Midland, Ontario L4R 4L3. Tel: (705) 526-9388.
Extrusion lines for pipe, profile, film compounding, paper coating/laminating, wire & cable. Screw diam 25 to 254 mm. Vertical coextruders with screw diam from 32 to 64 mm. Special reclaim lines with force-feeding hoppers. Calendering and embossing equipment, laminating and printing, film slitters.

Polysystem Machinery Mfg. Inc.
1710 Bonhill Rd, Mississauga, Ontario L5T 1C8. Tel: (416) 671-8090.
Designs and manufactures blown film dies for up to five layer co-extrusions including internal bubble cooling packages and air rings. Extruders for all extrusion processes, custom-designed feed screws for all materials including LLDPE and HMW-HDPE, film reclaim systems.

Uni-Flo Design Inc.
8031 Dixie Rd South, Brampton, Ontario L6T 3V1. Tel: (416) 791-2201.
Dual-cool air rings and dies for the blown film industry. Special features: self-aligning, non-adjustable die components; separate die-lip temperature controls.

Major Canadian manufacturers of molding machines

Injection Molding

Bata Engineering
Batawa, Ontario K0K 1E0. Tel: (613) 398-6106.
Manufactures vertical clamp injection molding machines, primarily for molding shoe soles, but also for other applications in PVC and polyurethane molding. Makes cutting machinery which utilizes water jets to cut plastic sheet.

Husky Injection Molding Systems Ltd.
P.O. Box 1000, Bolton, Ontario L0P 1A0. Tel: (416) 857-3240. Tlx: 06-969705.
Injection molding systems (molds, machines, product handling equipment, hot runners). Machines with clamp force ranging from 150 to 800 ton. Models available for unscrewing applications or insert molding. Machine options include: robots for parts removal; container stackers; carton indexers; take-away conveyors.

Ludwig Engel Canada Ltd.
545 Elmira Rd, Guelph, Ontario N1K 1C2. Tel: (519) 836-0220. Tlx: 06-956541.
Machines with clamp force from 25 to 400 ton. Can be equipped for molding liquid silicone or thermosets. Options include: quick mold change system; CC80 microcomputer control.

Principal Plastics Machinery Ltd.
1220 Ellesmere Rd, Unit 11 & 12, Scarborough, Ontario M1P 2X5. Tel: (416) 292-7228. Tlx: 06-525401.
Joint venture with Rico-Rego GmbH of West Germany to assemble and eventually build injection molding machines in Canada.

Techmire Ltée
7535 M.B. Jodoin, Ville D'Anjou (Montreal), Quebec H1J 2H9. Tel: (514) 354-6110. Tlx: 05-829768.
Multishot injection molding machines and tooling for production of precision-molded parts, insert molding, and continuous strip molding. Clamp force: 24 ton. Also makes *Multishot* die casting machines and tooling.

Blow molding

Millcreek Manufacturing Ltd.
6535 Millcreek Dr, Unit 3, Mississauga, Ontario L5N 2M2. Tel: (416) 821-3500. Tlx: 06-218140.
Manufactures rotary blow molding machines – 2, 3, 4 or 6 stations. Five-ton and 10-ton models. Options: automatic bottle orientation, semi-automatic or fully-automatic trimming systems.

Lee-Jay Machinery
(see listing under Auxiliary Equipment)

EPS foam molding

Soprem Inc.
800 Cure-Boivin, Boisbriand, Quebec J7G 2A7. Tel: (514) 430-4220.
Molding presses for EPS foam; pre-expanding, drying and handling equipment for EPS foam; packaging and bagging equipment. Turnkey EPS molding plant capability.

Major Canadian manufacturers of auxiliary equipment

Beel Controls Ltd.
2650 Pitfield Blvd. Montreal, Quebec H4S 1G9.
Tel: (514) 334-6500
Proportioning heat controllers and solid state temperature controllers for barrels and ovens. Drive units for extruders, nip rollers and winders.

Berg Chilling Systems Ltd.
51 Nantucket Blvd. Scarborough, Ontario M1P 2N6 Tel: (416) 755-2221 Tlx: 06-963657.
Refrigerated chilling systems and pumping systems for industrial process cooling. Equipment can be centralized or portable and is available in air or water-cooled design.

Cactus Machinery Inc.
205 Torbay Rd. Unit 7A, Markham, Ontario L3R 3W7 Tel: (416) 475-9689.
Makes *Cactus Super* Dryers for processing hygroscopic resins without predrying. Also makes an automatic hopper loader.

Canada Stamp & Stencil Co. Ltd./Cassco Machines
4 William Morgan Dr. Toronto, Ontario M4H 1E6 Tel: (416) 425-4140 Tlx: 06-219888
Designs and builds *Cassco* hot stamping equipment: turntables, feeders, automatic take-offs, tools, dies and fixtures. Microprocessor controls and special electronics applications for hot stamping machinery. Silicone rubber sheets, die and rollers.

Canadian Feed Screws Mfg. Ltd.
80 Venture Dr. Scarborough, Ontario M1B 3L6
Tel: (416) 284-8880 Tlx: 06-526156.
Builds, rebuilds and repairs: extruder screws, injection screws, twin screws, extruder barrels. Can supply special mixing sections for particular production needs.

A.C. Hamilton & Company (Canair)
5585 Timberlea Blvd, Mississauga, Ontario L4W 2S4 Tel: (416) 625-2965 Tlx: 06-961167
Manufactures a wide range of auxiliary equipment. A major export product is a computer-compatible weigh/blend unit.

Mold-Masters Limited
233 Armstrong Ave, Georgetown, Ontario L7G 4X5 Tel: (416) 453-1223 Tlx: 06-976831.
Melt conveying technology using three nozzle types with seven distinct gating methods plus hot runner manifolds and temperature controllers.

Lee-Jay Machinery Ltd.
6115 Shawson Dr. Mississauga, Ontario L5T 1E4
Tel: (416) 673-3313
Makes the *Plastiphase* pre-plasticizer. Custom-builds special purpose secondary operation machinery and processing equipment. Remanufacture and upgrades plastics molding equipment. Manufacture large capacity extrusion blow-molding equipment.

MJM Conveyors
6115 Shawson Dr. Mississauga, Ont. L5T 1E4
(416)673-3316/7 Manufacture economical belt sna roller-type conveyors for the plastics and other industries in standard lengths and configurations. Will design special and build special conveyor systems.

Morley Manufacturing Co. Ltd.
P.O. Box 143, Unionville, Ontario L3R 2L8 Tel: (416) 475-0568
Manufactures granulators, ribbon blenders, vacuum and spray tanks.

Mould-tek Industries Inc.
733 Progress Ave. Scarborough, Ontario M1H 2W7 Tel: (416) 438-6875 Tlx: 06-525311
Bulk handling equipment: silo systems, railcar unloading and loading systems, surge bins, individual and central filter systems, plastics grinding machines, material blending units.

Plastics Machinery Inc.
205 Torbay Rd. Unit 7A, Markham, Ontario L3R 3W4 Tel: (416) 475-6677 Tlx: 06-986104
Primarily a distributor of plastics machinery, but also manufactures an electrical temperature controller for mold hot-runner systems. Handles used machinery.

Progress Precision Inc.
3555 Hawkestone Rd. Mississauga, Ontario L5C 2V1. Tel: (416) 275-3323 Tlx: 06-986766
Extruder screws and feed screws.

Sealetronics
1730 McPherson Ct. Unit 34, Pickering, Ontario L1W 3E6 Tel: (416) 831-2202
High frequency sealing equipment and accessories, shuttles, turntables, shields, roll-feed guides.

York Extruders Screw Mfg. Co.
461 Esna Park Dr. Markham, Ontario L3R 1H8
Tel: (416) 475-0621
Extruder screws, barrel and screw repair.

TABLE 17

Major plastics machinery & parts companies exporting

Husky Injection Molding Systems	Injection molding machines
Engel of Canada	
Continental Injection Molding Machinery	
Brampton Engineering	Blow film extrusion systems
Future Design Inc.	
Macro Engineering	
Polysystem Machinery	
Uni-Flow Design Inc.	
Bolco International	Extrusion equipment
Deltaplast	Complete profile extrusion systems
Lembo-Midland	Extrusion/calendering
Metaplast Limited	Downstream extrusion equipment
Corma Inc.	Corrugating pipe equipment
Drossbach NA	
Canadian Feed Screws	Extrusion screws
Unipol Design	
Progress Precision	
GN Plastics	High speed pressure-forming equipment

Canada Stamp Birch Manufacturing	Hot stamping equipment
Cactus Machinery Cramer Principal Drying Systems	Dryers
Millcreek Manufacturing	Rotary blow molding equipment
Soprem Inc.	Dry molding equipment for expanded polystyrene
F S P Machinery	Rotational molding machine
Berg Chilling Systems	Water chiller equipment
Techmire Limited	Specialized small molding machines.

CANADIAN MOLD AND DIE MAKERS

Quality, quick delivery and price. These are the three major objectives a moldmaker has to achieve in order to remain in business. This is true both domestically and in the export market.

Accepted as a fact of survival life in almost all Canadian industries, including moldmaking, is the need to export. The Canadian market is simply not large enough for the approximately 200 moldmakers serving the plastics industry in this country.

The Canadian moldmaker has two basic export markets: one is the U.S. and the second is everywhere else.

In 1986, exports of plastics molds and dies totaled over $239 million, up about 20% from 1985 (see table 18). About 75% of molds and dies produced in Canada for plastics go to the United States. Today, "made in Canada" molds turn up in Europe, Latin America, the Caribbean, the Far East and even the People's Republic of China.

TABLE 18

Canada's trade in molds and dies for plastics machinery

($ million)

		1984	1985	1986
Exports to:	USA	162.7	190.6	223.3
	U.K.	3.0	3.2	2.1
	W. Germany	1.9	1.7	4.9
	Japan	0.5	0.9	1.3
	All others	4.9	3.4	7.9
TOTAL:		**173**	**199.8**	**239.5**
Imports into Canada:		**25.9**	**34.7**	**34.2**

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- M. Wareham, Canadian Plastics, October 1986.
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- M. Lauzon, Canadian Plastics, July/August 1987
- D. Burn, Canadian Plastics, July/August 1987
- Modern Plastics International, January 1988
- Canadian Packaging, February 1988
- Canadian Plastics, April 1988
- Plastics Business, April 1988

APPENDIX

Example of Automotive Parts Processed in Canada

Blow moulding
- windshield washer bottle
- radiator overflow bottle
- various ducts (heater, air)

Extrusion: gaskets, trims, tubing, hoses, floor mats.

Calendering: crash pads, upholstery (vinyl fabrics, etc.)

Injection moulding: various small parts (under the hood)

Vacuum forming: instrument panels, facia panels, dashboard covers.

Compression moulding: car bodies, panels.